

## Bornean Gekkonid Lizards of the Genus *Cyrtodactylus* (Lacertilia: Gekkonidae) with Descriptions of Three New Species

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**Abstract:** Bornean gekkonid lizards of the genus *Cyrtodactylus* were revised, three new species, *C. ingeri* sp. nov., *C. matsuii* sp. nov. and *C. yoshii* sp. nov., were described from Sabah, Malaysia, and two forms, *C. consobrinus* (Peters, 1871) and *C. malayanus* (De Rooij, 1915) were redefined. A revised taxonomic key for Bornean *Cyrtodactylus* was provided.

**Key words:** Borneo; *Cyrtodactylus*; *C. ingeri* sp. nov.; *C. matsuii* sp. nov.; *C. yoshii* sp. nov.

Seventy-eight species are recognized in the gekkonid genus *Cyrtodactylus* (Kluge, 1983; Baran and Gruber, 1982; Dring, 1979; Golubev and Shcherbak, 1981; Khan, 1980, 1988; Leviton and Anderson, 1984). Of these, five are recognized as Bornean members (Inger, 1957; Inger and King, 1961). Two species possess a preanal groove and the remaining three species lack it. The former are *C. pubisulcus* and *C. cavernicolus*, while the latter are *C. baluensis*, *C. consobrinus*, and *C. malayanus*.

The Kyoto University Zoological Expeditions to Sabah and Sarawak, East Malaysia conducted biennially since 1979, amassed a collection of reptiles, which included specimens of *Cyrtodactylus*. After examining these specimens and comparative specimens including type specimens of *C. malayanus* and *C. consobrinus*, I found that the last two species were confused with each other in previous studies (Inger, 1957; Inger and King, 1961) and that three undescribed species were included in the collection. These species resemble *C. baluensis*, *C. consobrinus*, and *C. malayanus* by lacking a preanal groove, but differ from them in several combinations of characters, such as femoral pores, subdigital scales and mid-belly scales, etc.

Here I revised the lizard genus *Cyrtodactylus* in Borneo, adding three new species to the Bornean members. Before starting this study, Dr. R. F. Inger kindly gave information about Bornean *Cyrtodactylus* and loaned specimens. He had already recognized two problematic forms in Bornean *Cyrtodactylus* and treated them tentatively as *C. consobrinus*. These are described as two new species in this paper.

*Cyrtodactylus baluensis* (Mocquard, 1890)  
(Figs. 1, 2)

*Gymnodactylus Baluensis*—Mocquard, 1890, p. 144; Mocquard, 1890, p. 125, pl. 7.

*Gymnodactylus baluensis*—De Rooij, 1915, p. 14.

*Cyrtodactylus baluensis*—Underwood, 1954, p. 475; Inger, 1957 (1958), p. 264; Inger and King, 1961 (1962), p. 276.

*Gymnodactylus (Cyrtodactylus) baluensis*—Wermuth, 1965, p. 48.

**Type specimens.**—Six type specimens are kept in Muséum National d'Histoire Naturelle, Paris (Brongersma, 1934). Type locality is Mt. Kinabalu, North Borneo (Mocquard, 1890).

**Diagnosis.**—A medium-sized *Cyrtodactylus* with an adult size of 71.7–85.5 mm in SVL (snout-vent length); no preanal groove; 9–10 preanal pores forming a narrow angular series in a distinct hollow, separated from femoral pores; a sharp boundary of scale size in thigh between large ventral scales and posterior granular scales; 6–9 femoral pores in larger femoral scales of the boundary; largest subdigital of basal phalanges four times as adjacent scales; 21–23 subdigital scales on fourth toe; 40–45 mid-ventral scale rows between lateral folds; irregular dark crossbands on the dorsum.

**Distribution.**—This species is known as a mountain form, occurring at high altitudes in northern part of Borneo, such as Mt. Kinabalu (900–2200 m; Smith, 1925a), Kimanis Pass of Crocker Range (1220 m), and Mt. Murud (1400–1800 m; Smith, 1931), but is also found from rather low altitudes, as in Melinau Gorge in Mulu National Park (160 m), Mt. Mulu (540 m) and Danum Valley (less than 500 m).

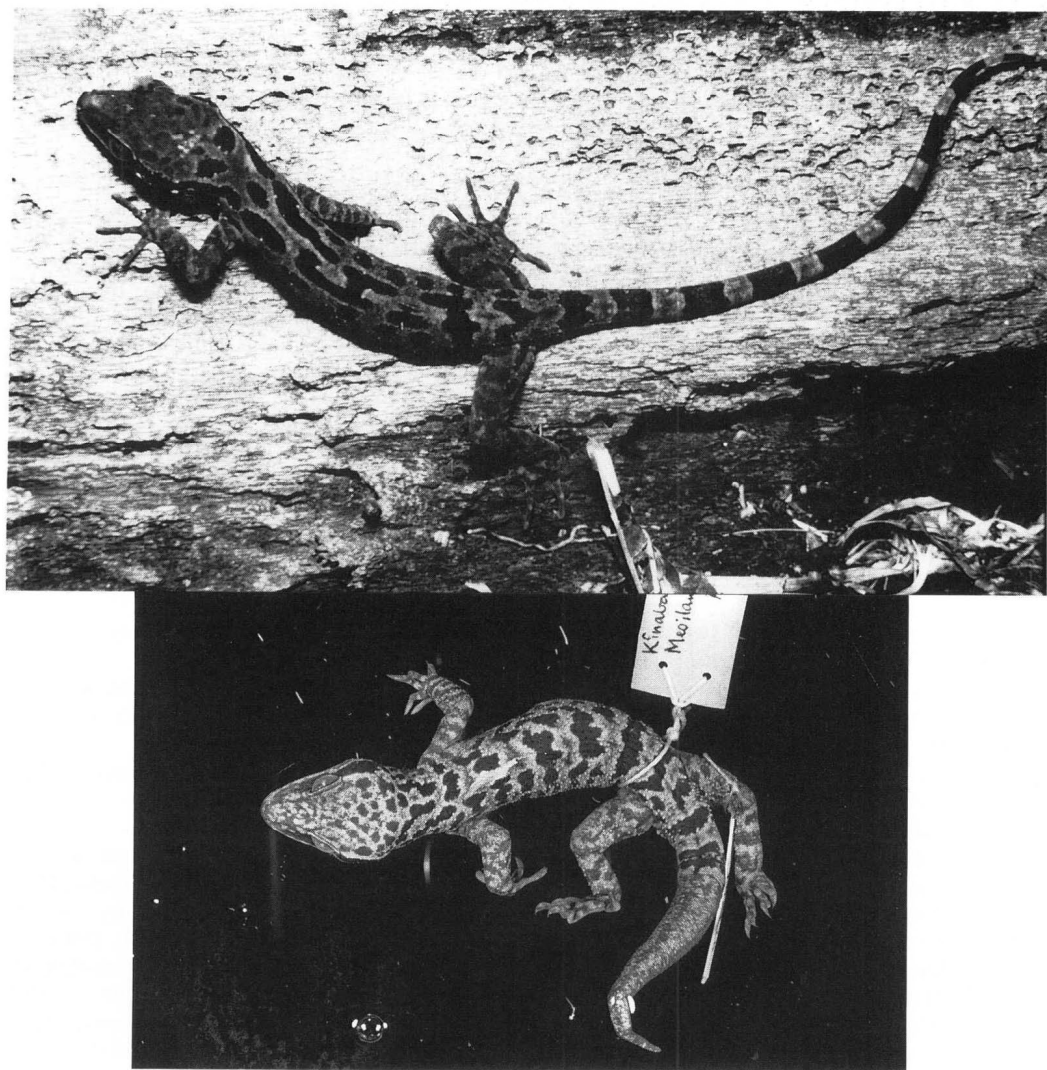


FIG. 1. *Cyrtodactylus baluensis* (Mocquard, 1890). Upper: a male with a longitudinal pattern from Mulu National Park, Sarawak (KUZ 12273). Lower: a male with dark crossbands from Mt. Kinabalu, Sabah (FMNH 152178).

**Ecological notes.**—The specimens were found on tree trunks in Kinabalu Park (Matsui, personal communication) and in Mulu. One dead specimen was obtained from a hen picking it at Bundutuhan Village, Mt. Kinabalu. This species occurs syntopically with *C. consobrinus* and *C. yoshii* in Danum Valley, and *C. consobrinus* and *C. pubisulcus* in Mulu.

Two eggs were found 3 cm under the humus between the roots of the tree in Crocker Range, Sabah on 20 August 1987. These eggs, white and rather hard, were not adhering to anything and round-shaped with diameters of  $15.4 \times 12.3$

and  $15.3 \times 12.4$  mm, respectively. They were hatched on 11 October and their sizes were 31.8 and 32.2 mm in SVL and 33.5 and 35.4 mm in TL (tail length).

**Remarks.**—Although females lack distinct preanal pores or femoral pores, preanal scales were modified in wider angular series in flat surface of preanal region. Larger females rarely possessed indistinct pores.

This species usually has irregular dark crossbands on brown ground color of dorsum, but shows two other types of color variations: in one case broken crossbands change into

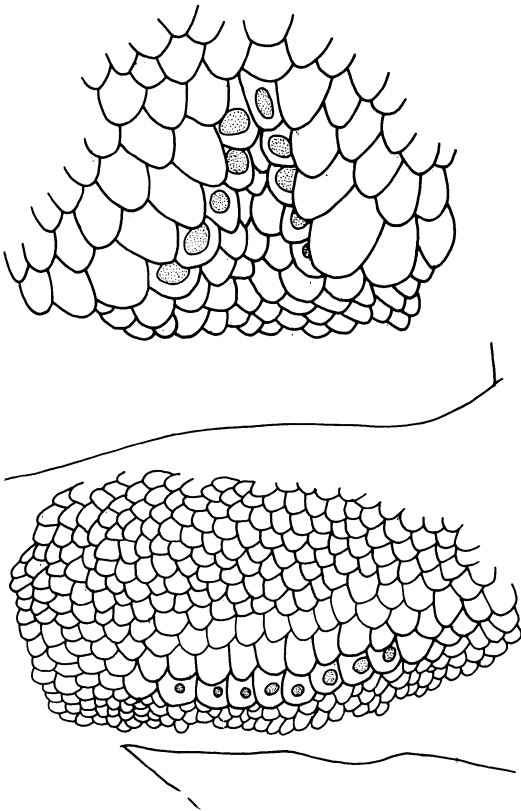


FIG. 2. Preanal pores (upper) and femoral pores (lower) in an adult male of *C. baluensis* (KUZ 12109) from Bundutuhan Village near Mt. Kinabalu.

blotches, and in another case longitudinally connected bands or blotches change into lines. The color patterns and variations of this species resemble those of *C. pubisulcus*.

*Specimen examined*.—Danum Valley, Lahad Datu District, Sabah: FMNH (Field Museum of Natural History) 230090, 230177–81; Mt. Kinabalu, Ranau District, Sabah: FMNH 152178, KUZ (Kyoto University, Zoology) 12107–8; Bundutuhan Village, Ranau District, Sabah: KUZ 12109; Kimanis Pass, Crocker Range, Sabah: KUZ 12105–6; Mt. Murud, Miri Division, Sarawak: SM (Sarawak Museum) 7213–5; Mt. Mulu, Mulu National Park, Miri Division, Sarawak: KUZ 12220–2; Melinau Gorge, Mulu National Park, Miri Division, Sarawak: KUZ 12273.

*Cyrtodactylus cavernicolus* Inger et King, 1962 (Figs. 3, 4)

*Cyrtodactylus cavernicolus*—Inger and King, 1961 (1962), p. 274.

*Type specimens*.—A holotype FMNH 128388, collected by Tom Harrison in the Great Cave, Niah, Miri District, Sarawak, on 5 April 1960. Ten paratypes were also collected at same locality in 1960 and are also deposited in Field Museum of Natural History (Inger and King, 1961).

*Diagnosis*.—A medium-sized *Cyrtodactylus* with an adult size of 63.5–80.8 mm in SVL; a preanal groove containing two pairs of pores; small granules of posterior surface of thigh merging gradually into slightly larger ones on ventral surface; no femoral pores or enlarged femoral scales; 22–26 subdigital lamellae on fourth toe; largest subdigital of basal phalanges more than four times as wide as adjacent scales; 51–58 mid-ventral scale rows between lateral folds; wide banded pattern on dorsum.

*Distribution*.—This species has been known only from Niah Great Cave and is considered to be confined there. We, however, obtained one specimen from Melinau Gorge, Mulu National Park. Chapman (1985) also reported a *Cyrtodactylus* specimen resembling *C. cavernicolus* from Wonder Cave of Mt. Api, Mulu National Park.

*Ecological notes*.—This gecko is a cave-dweller and its life habits were noted by Harrison (1961, 1966). The specimen from Mulu was collected on a rainy night crawling on limestone rocks of Melinau Gorge, outside of crevices or caves of the rock.

*Specimens examined*.—Niah, Miri Division, Sarawak: FMNH 131505, 131507, 131509–11, Melinau Gorge, Mulu, Miri Division, Sarawak: KUZ 12280.

*Cyrtodactylus consobrinus* (Peters, 1871) (Figs. 5, 6)

*Gymnodactylus consobrinus* (part)—Peters, 1871, p. 569; Peters, 1872, p. 27, Taf 2, Fig. 1; Boulenger, 1885, p. 47; De Rooij, 1915, p. 21. *Cyrtodactylus consobrinus*—Underwood, 1954, p. 475.

*Cyrtodactylus malayanus*—Inger, 1957 (1958), p. 264; Inger and King, 1961 (1962), p. 276; King, 1962, p. 120.

*Gymnodactylus* (*Cyrtodactylus*) *malayanus*—Wermuth, 1965, p. 61.

*Cyrtodactylus consobrinus kinabalensis*—Malkmus, 1989, p. 169.

*Type specimen*.—The holotype is a male specimen from Matang near Kuching, Sarawak,



FIG. 3. *Cyrtodactylus cavernicolus* Inger et King, 1962 from Melinau Gorge, Mulu National Park, Miri Division, Sarawak (KUZ 12280).

and is now kept in Museo Civico di Storia Naturale, Genova, Italy.

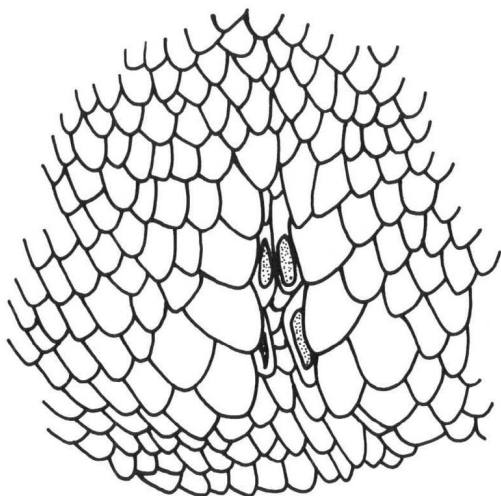


FIG. 4. A preanal groove and pores in a male specimen (KUZ 12280) of *C. cavernicolus*.

**Diagnosis.**—A large-sized *Cyrtodactylus* with an adult size of 97.4–121.1 mm in SVL; no preanal groove; usually 9 or 10 preanal pores forming an angular series in males; small granules of posterior surface of thigh merging gradually into slightly larger ones on ventral surface; enlarged femoral scales developed at least on ventroposterior surface of distal part of thigh, 1–6 femoral pores present or absent in males; 23–28 subdigital lamellae on fourth toe; largest subdigital of basal phalanges three or four times as wide as adjacent scales; 58–65 mid-ventral scale rows between lateral folds; light narrow-lined network on head and narrow white crossbands on dorsum.

**Data for holotype.**—An adult male specimen with 105 mm in SVL and 120 mm in TL; no preanal groove; 10 preanal pores in a wide angular series; no femoral pores, but 6, 7 enlarged scales on ventro-posterior border of thigh; scales of posterior surface of thigh slightly smaller than those of ventral surface, but the two sizes not sharply separated; ventral scales of basal phalanx of fourth toe 2–3 times size of adjacent scales. (Dr. R. F. Inger examined the

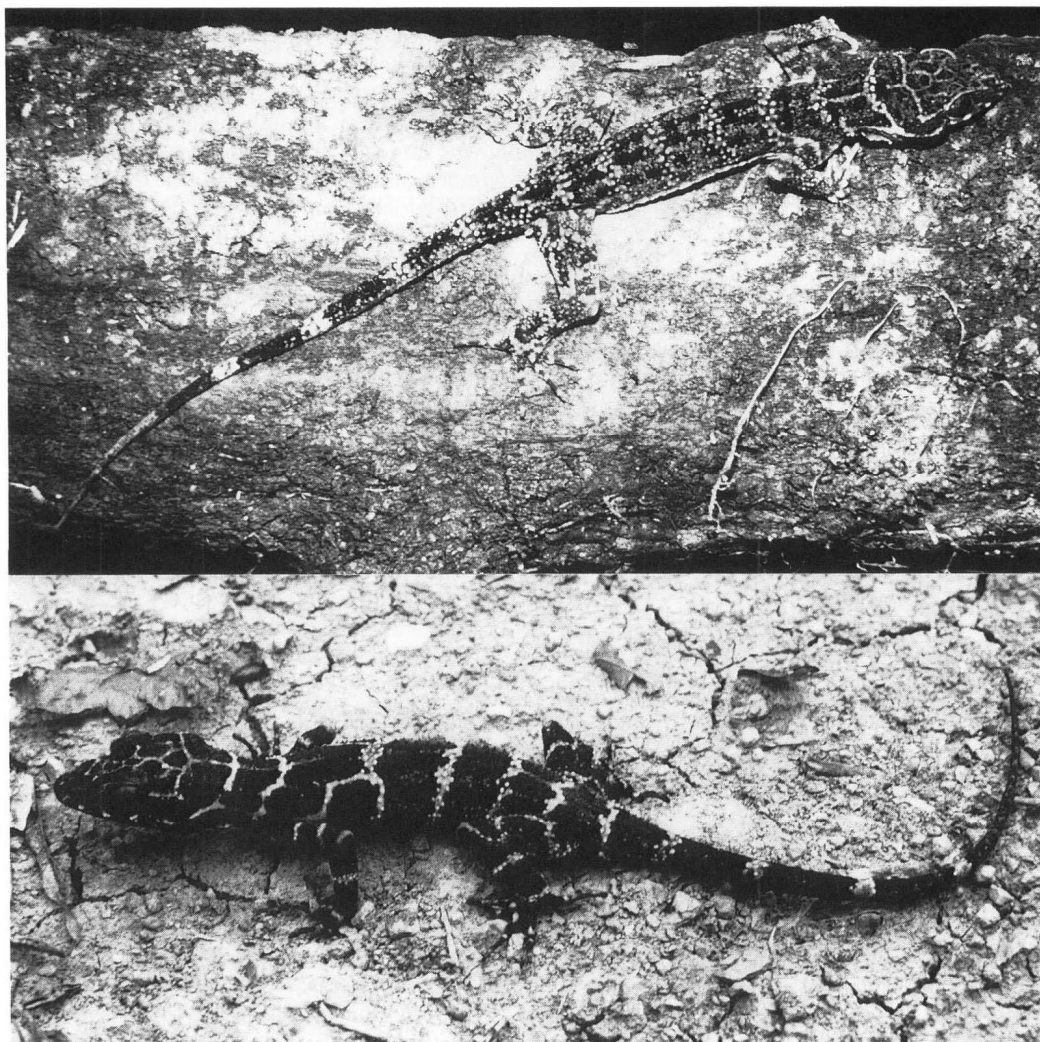


FIG. 5. *Cyrtodactylus consobrinus* (Peters, 1871). Upper: an adult female (KUZ 12275) from Mulu National Park, Miri Division, Sarawak. Lower: an adult male (KUZ 12113) from Sepilok Forest Reserve, Sandakan District, Sabah.

holotype and gave me detailed information of the holotype, and Dr. L. Capocaccia also gave me measurement data and photographs of the holotype).

**Distribution.**—This species occurs in lowland forests throughout the states of Sabah and Sarawak, and probably in Kalimantan. It is also reported from outside of Borneo: Sumatra and Singkep by De Rooij (1915) and Malayan Peninsula by Grandison (1972) and Dring (1979).

**Remarks.**—This species has been confused with *C. malayanus* (Inger, 1957; Inger and King,

1961; King, 1962). The type specimen of *C. consobrinus* lacks femoral pores but possesses enlarged femoral scales. However, the feature of the femoral region is unstable. Among several specimens from the type locality, Matang (including Mt. Serapi), some have only slightly enlarged scales on the femoral region but no pores even in adult males, while other male specimens have distinct femoral pores on enlarged femoral scales. I think these states of femoral pores are within the intraspecific variation of *C. consobrinus*. By examining the type specimen of *C. malayanus*, I confirmed that this

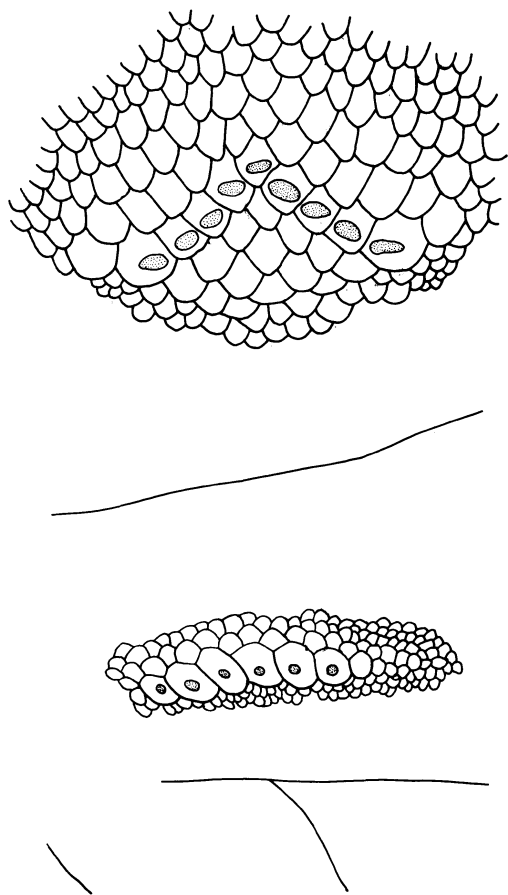


FIG. 6. Preanal pores (upper) and femoral pores (lower) of an adult male specimen (KUZ 12113) of *Cyrtodactylus consobrinus* (Peters, 1871).

male specimen lacks either femoral pores or enlarged femoral scales. Although their color patterns resemble each other, *C. consobrinus* distinctly differs from *C. malayanus* by having preanal pores or at least femoral scales. The larger adult body size (usually more than 100 mm in SVL) also discriminates it from *C. malayanus*.

**Variation.**—Young specimens are very dark-colored with narrow white lines on the dorsum. In adult, dark regions usually discolor and the narrow white lines maintains black-edges (Fig. 5. upper), but the specimens of populations from Sabah retain juvenile color pattern even in the adult stage (Fig. 5. lower). Although larger adult females possess indistinct preanal pores, they have no femoral pores and sometimes lack even enlarged femoral scales.

Malkmus (1989) recognized a new subspecies

of *C. consobrinus* from Poring, Ranau, Sabah, based on a single young adult female specimen with a 94 mm SVL. He cited the description by De Rooij (1915) and discriminated his new subspecies from a nominotypical subspecies by having larger number of preanal pores, smaller number of labials (15–14 upper labials, 13–12 lower labials), and distinct dorsal tubercles. However, in examining specimens from Sabah and Sarawak, I could not find such differences between the populations. Number of labials are rather variable (upper labials 10–16; lower labials 9–13) and moreover, preanal pores in females are usually undeveloped. To accept his subspecies, one must examine more specimens, especially adult males, and study the geographic variation of the species.

**Ecological notes.**—This species is a common arboreal species dwelling in lowland forests and is usually found at night on tree trunks or stumps with crevices or holes, that are used for their shelters. This species breeds continuously throughout the year as reported by Inger and Greenberg (1966) under the name of *C. malayanus*.

**Specimens examined.**—Sepilok, Sandakan District, Sabah: KUZ 8711, 8644, 8864, 12111, 12113; Danum Valley, Lahad Datu District, Sabah: FMNH 230113–4; Brumas, Tawau District, Sabah: KUZ 12112, 12114; Mulu National Park, Miri Division, Sarawak: KUZ 12225, 12232, 12234, 12237, 12274–5, 12301; Segiam River, Kapit Division, Sarawak: SM 1 specimen uncataloged; Mengiong River, Kapit Division, Sarawak: FMNH 149644, 149749, 149761–2, 149772, 149790; Beloh River, Song, Kapit Division, Sarawak: KUZ 12372, 12376; Mt. Serapi, Kuching Division, Sarawak: KUZ 9060, 12163, 12166, 12328–30, 12333, 12335, 12481, 12567–9; Matang, Kuching Division, Sarawak: SM cc. 1.1.2. b; Mt. Temiang, Samarahan Division, Sarawak: SM 1 specimen uncataloged.

*Cyrtodactylus ingeri* sp. nov.  
(Figs. 7, 8)

*Cyrtodactylus consobrinus*—Inger, 1957 (1958), p. 264; Inger and King, 1961 (1962), p. 276; King, 1962, p. 120.

**Holotype.**—OMNH R 2993, adult male, collected near Poring Hot Spring, Ranau District, Sabah by Masafumi Matsui, Tsutomu Hikida, Lantoh Saikeh and Ampawih Ajis on 22 March 1979.

**Paratype.**—FMNH 76238, adult male, collected from Deramacot, Kinabatangan District, Sabah by Robert F. Inger on 6 May 1956.

**Diagnosis.**—A small-sized *Cyrtodactylus* with



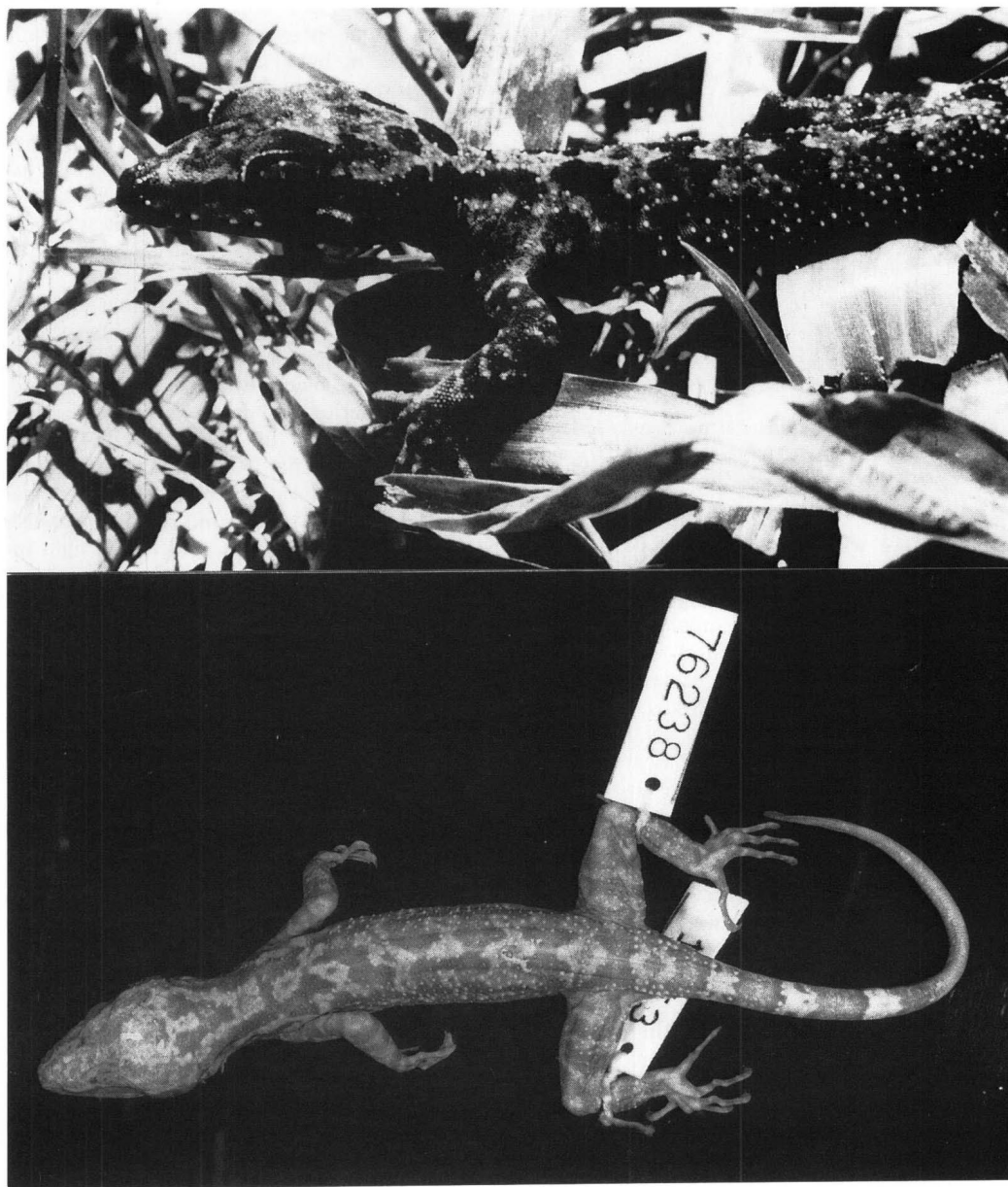


FIG. 7. *Cyrtodactylus ingeri* sp. nov. A holotype (upper: OMNH R 2993) in life from Poring, Ranau, Sabah and paratype (lower: FMNH 76238) from Deramacot, Kinabatangan, Sarawak.

an adult body size of 65.3–75.8 mm in SVL; no preanal groove; eight preanal pores forming a narrow angular series in a distinct hollow; small granules of posterior surface of thigh merging gradually in slightly larger ones on ventral surface; no femoral pores; no enlarged femoral scale series; 23–27 subdigital lamellae on fourth toe; largest subdigital of basal phalanges about

four times as wide as adjacent scales; 40–43 mid-ventral scale rows between lateral folds; dark paravertebral blotches longitudinally distributed on dorsum.

*Description of holotype.*—Head oviform; forehead concave; snout obtusely pointed, 1.90 times the horizontal diameter of eye; ear-opening oval, distance from eye greater than eye

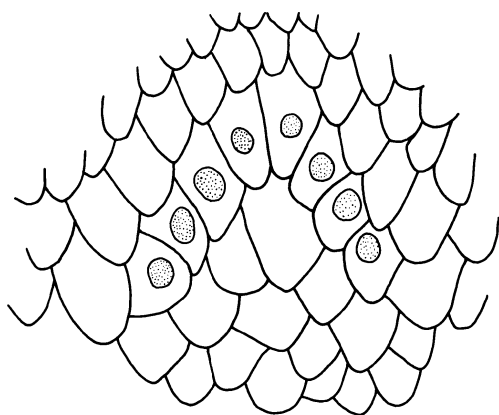


FIG. 8. Preanal pores in a narrow angular series of a male specimen (holotype, OMNH 2993) of *Cyrtodactylus ingeri* sp. nov.

diameter; eye with vertical *Gekko*-type pupil; rostral large, quadrangular, entering nostrils, partially split by a small quadrangular scale; first upper labial entering nostril; upper labials, 10 on left and 12 on right; internasals small, three bordering rostral; superciliary scales forming a distinct "eye-brow", slightly enlarged; remainder of upper head scales uniformly small; mental triangular, wider than bottom of rostral; lower labials 9 on left and 10 on right; one large pair of post-mentals forming a suture behind mental; second post-mental approximately one-third the size of the first, widely separated by the first; four gular scales bordering first postmentals between second postmental followed by small gular granules.

Body somewhat depressed, covered about with small granules interspersed with 17 irregular rows of distinct conical tubercles; ventrolateral fold feebly indicated by low, rounded tubercles; ventral scales small, cycloid, larger than dorsal tubercles, 43 mid-ventral scale rows between lateral folds; no preanal groove; eight preanal pores forming a narrow angular series in a preanal hollow.

Ventral surface of thigh covered with scales smaller than those of abdomen and gradually becoming smaller posteriorly; no femoral pores; dorsal surface of thigh and lower legs covered with small granules intermixed with distinct tubercles; forelimbs with tubercles.

Digits clawed slender, distal two or three phalanges making an angle with the proximal portion; largest subdigital scales beneath basal phalanges four times as wide as adjacent scales, gradually decreasing in size on base; subdigital

of distal phalanges wide, becoming gradually smaller granules proximally, and meeting greatly wider basal subdigital lamellae beneath the kinked portion; subdigital lamellae of fourth toe 23 scales from base to claw.

Tail round; covered dorsally and laterally with small granules and rings of tubercles; approximately 11–12 rows of granules between successive rings of tubercles; subcaudals unpaired and wide, but some paired; distal half of tail regenerated.

Color (in life): brown above, lighter below; a blackish brown stripe from lower posterior corner of eye passing just above ear-opening to arm insertion; three blackish brown spots on nape, first two anterior and last one posterior; two longitudinal rows of five blackish brown paravertebral blotches from axilla to groin, with another pair of dark blotches on waist; dorsal tubercles on brown ground color yellowish white; tail with dark rings, wider than light interspaces; upper and lower lips with a row of white dots; dorsal surfaces of limbs with dark spots and yellowish dots.

Color (in alcohol): Color faded; dorsum creamy white with brown blotches; ventral surface creamy white.

*Measurements of holotype (in mm).*—SVL 75.8, TL 79.0, RTL (length of regenerated part of tail) 39.5, AGL (axilla to groin length) 34.2, SSL (snout to shoulder length) 29.9, SEO (snout to ear-opening length) 19.5, HW (head width) 13.8, HD (head depth) 8.3, EL (horizontal eye length) 5.0, SE (snout to eye length) 9.5, EEO (eye to ear-opening length) 6.4, NN (distance between nostrils) 2.4, EE (distance between eyes at anterior corner) 6.3, FLE (forelimb length) 27.1, HLL (hindlimb length) 37.1 and HT-IV (length of fourth toe) 8.3.

*Data for paratype.*—Eight preanal pores; upper labials 10 on left and 12 on right; lower labials 10; five scales bordering first postmental between second postmentals; 23 subdigital lamellae of fourth toe; 40 mid-ventral scale rows between lateral folds.

SVL 65.3, TL 68.0, RTL 37.0, AGL 28.8, SSL 27.2, SEO 17.8, HW 11.8, HD 7.2, EL 5.0, SE 8.9, EEO 5.9, NN 2.5, EE 5.7, FLL 22.7, HLL 31.2 and HT-IV 7.2.

*Etymology.*—The species name is dedicated to Dr. Robert F. Inger, who contributed greatly to Bornean herpetology. He is also the collector of the paratype specimen.

*Remarks.*—This species is known only from Sabah, i.e., Poring Hot Spring, Ranau District and Deramacot, Kinabatangan District. It is



most similar to *C. malayanus*, but differs from the latter in color pattern and smaller number of mid-ventral scale rows.

*Ecological notes.*—The holotype was captured on the forest floor near a small stream in Poring Hot Spring and the paratype was collected crawling on rocks at night. This species seems to be syntopic with *C. consobrinus*, since the latter species was found in Poring by Malkmus (1988). The testis size of the holotype, collected in March, was  $5.3 \times 3.3$  mm and the epididymides were developed.

*Cyrtodactylus malayanus* (De Rooij, 1915)  
(Figs. 9, 10)

*Gymnodactylus malayanus*—De Rooij, 1915, p. 20; Brongersma, 1934, p. 168.

*Gymnodactylus baluensis*—De Jong, 1928, p. 14.

*Cyrtodactylus malayanus*—Underwood, 1954, p. 475.

*Gymnodactylus* (*Cyrtodactylus*) *malayanus*—Wermuth, 1965, p. 48.

*Type specimens.*—A lectotype is an adult

male, No. 11308 of ZMA (Zoölogisch Museum Amsterdam). A paralectotype is a female, also in ZMA. The type locality is Indo-Australian Archipelago.

*Diagnosis.*—A medium-sized *Cyrtodactylus* with an adult size of 70.4–83.0 mm in SVL; no preanal groove; 8–10 preanal pores forming a wide angular series; small granules of posterior face of thigh merging gradually into slightly larger ones on ventral surface; no femoral pores; no enlarged femoral scale series; 21–23 subdigital lamellae on fourth toe; largest subdigital of basal phalanges three or four times as wide as adjacent scales; 58–62 mid-ventral scale rows between lateral folds; light narrow-lined network on head and narrow white, black-edged crossbands on dorsum.

*Data for lectotype.*—Nine preanal pores; upper labials 9 on left and 11 on right; lower labials 10 pairs; subdigital lamellae of fourth toe 23 on left and 22 on right; 58 mid-ventral scale rows between lateral folds.

SVL 70.4, TL 97.0 (complete tail), AGL 31.2, SSL 27.3, SEO 18.4, HW 13.7, HD 8.1, EL 5.3, SE 9.1, EEO 6.1, FLL 26.4, HLL 36.1 and HT-IV 7.8.

*Remarks.*—The exact type locality of this

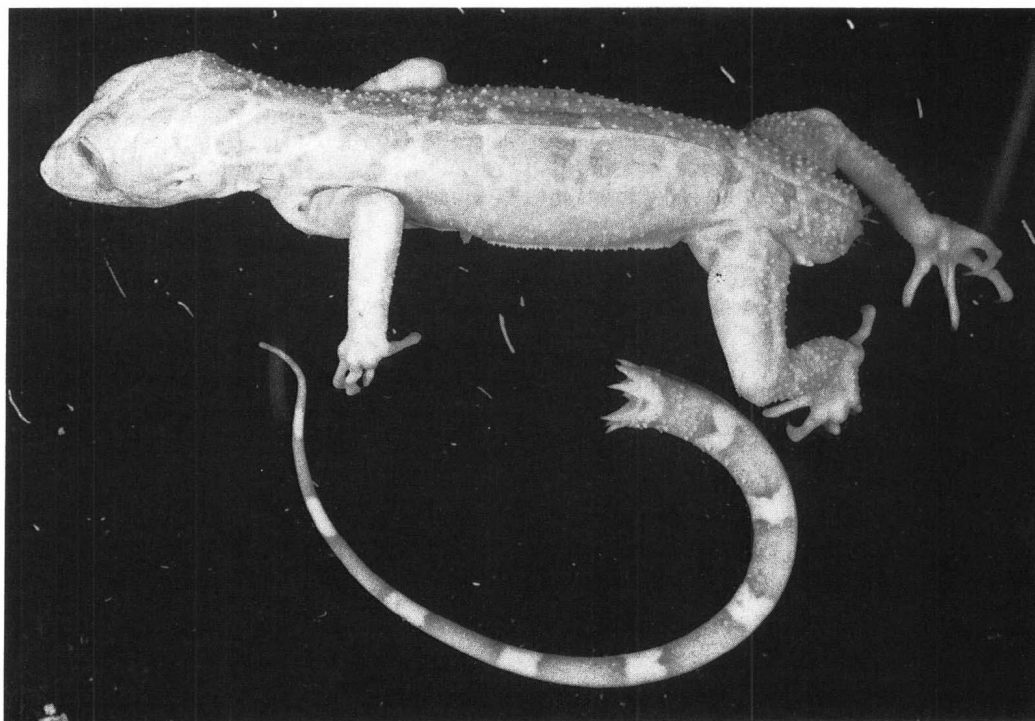


FIG. 9. *Cyrtodactylus malayanus* (De Rooij, 1915). A holotype (ZMA 11308).

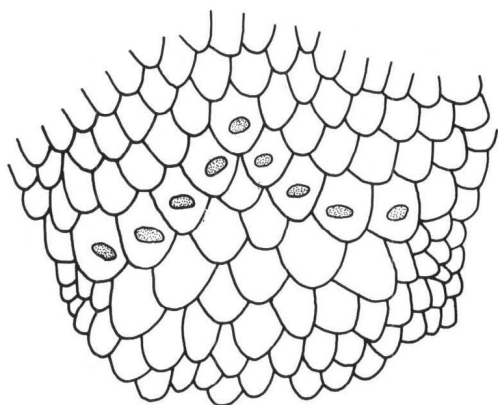


FIG. 10. Preanal pores of a male specimen (holotype, ZMA 11308) of *C. malayanus*.

species is unknown, being indicated as Indo-Australian Archipelago. One adult male specimen obtained by De Jong (1928) from Inner East Borneo was first identified as *C. baluensis*, but later proved to be *C. malayanus* by Brongersma (1934). Another adult male specimen newly collected from East Kalimantan was also identified as *C. malayanus*. As far as I have examined, all the specimens previously identified as *C. malayanus* are *C. consobrinus*. I could not find this species in the specimens from Sabah and Sarawak. It may be confined to the Eastern part of Borneo.

*Cyrtodactylus ingeri* most resembles *C. malayanus*, but is more slender than the latter and distinctly differs from the latter in color pattern. The former has a blotched pattern, but the latter has a narrow corssbanding pattern like *C. consobrinus*.

*Specimens examined*.—Indo-Australian Archipelago: ZMA 11308 (lectotype); Marah, Inner East Borneo: ZMA 15504; Mt. Pemantus, Sotek, East Kalimantan: NSMT (National Science Museum, Tokyo) 1 specimen, uncatalogued.

*Cyrtodactylus matsuii* sp. nov.  
(Figs. 11, 12)

*Holotype*.—OMNH R 2994, adult male, collected in the Park Headquarters of Kinabalu National Park at 1600 m in Mt. Kinabalu, Sabah, Malaysia, by Masafumi Matsui and Tsutomu Hikida on 24 March 1979.

*Diagnosis*.—A large species of *Cyrtodactylus* (104.5 mm in SVL); no preanal groove; seven preanal pores forming a wide angular series; small granular scales on posterior surface of thigh, meeting larger scales on ventral surface forming a sharp boundary; no femoral pores on boundary scales; largest subdigital scales on basal phalanges more than four times as wide as adjacent scales; 22 subdigital scales on fourth toe; 51 mid-ventral scale rows between lateral folds; dark crossbands on dorsum.

*Description of holotype*.—Head oviform; forehead concave; snout obtusely pointed, 1.84 times the horizontal diameter of eye; ear-opening oval, distance between eyes slightly greater than eye diameter; eye with vertical *Gekko*-type pupil; rostral large, quadrangular, entering nostrils, partially split by a median vertical furrow; first upper labial entering nostril; upper labials 11 on left and 10 on right; internasals small, three bordering rostral; superciliary scales forming a distinct "eye-brow", slightly enlarged; remainder of upper head scales uniformly small; mental triangular, wider than bottom of rostral;



FIG. 11. *Cyrtodactylus matsuii* sp. nov. from Mt. Kinabalu. A holotype (OMNH R 2994) in life.

lower labials 11 on left and 10 on right; one large pair of post-mentals forming a suture behind mental; second post-mental approximately one-third the size of the first, widely separated; two or three rows of slightly enlarged scales paralleling lower labials; four gular scales bordering first postmentals between second postmentals, larger than the remaining granular gular scales.

Body somewhat depressed, covered above with small granules interspersed with 18 irregular rows of subconical tubercles; ventrolateral fold feebly indicated by low, rounded tubercles; ventral scales small, cycloid, larger than dorsal tubercles, 51 scale rows between ventrolateral folds; no preanal groove; seven preanal pores in wide angular series; three pairs of cloacal spurs.

Another ventral scales of thigh cycloid, as large as belly scales, meeting small granular scales of posterior surface of thigh at sharp boundary; no femoral pores; dorsal surface of thigh and lower leg covered with small granules intermixed with tubercles; dorsal surface of forelimb with small granules intermixed with low tubercles.

Digits clawed slender, distal two or three phalanges making an angle with the proximal portion; mid-ventral row of scales on basal phalanges quadrangular, distinctly enlarged, largest subdigital four to five times the transverse diameter of adjacent scale rows; fourth toe with 22 scales from base to claw.

Tail round; covered dorsally and laterally with small granules and rings of low tubercles; approximately four to seven rows of granules between successive rings of tubercles; subcaudals squarish, about twice the size of dorsal tubercles including a few wide unpaired subcaudals; distal half of tail regenerated.

Color (in life): body yellowish brown above, lighter below; dorsal surface of head with small dark spots; a brown stripe from posterior corner of eye passing above ear-opening; two brown bands on nape and shoulder, respectively, four brown bands between axilla and groin, followed by one band on waist; round dark brown spots between 3rd and 5th bands; tail with dark rings, dorsally as wide as light interspaces; posterior part of upper lip white; dorsal surfaces of limbs with dark spots.

Color (in alcohol): Color faded; dorsum creamy white with light brown bands; ventral surface creamy white.

*Measurements of holotype (in mm).*—SVL 104.5, TL 82.5, RTL 34.0, AGL 47.0, SSL 43.0, SEO 26.8, HW 21.8, HD 10.7, EL 6.7, SE 12.3,

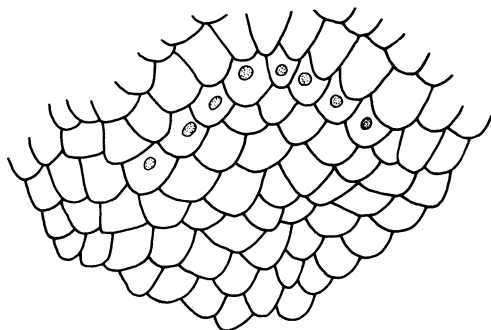


FIG. 12. Preanal pores of a male specimen (holotype, OMNH R 2994) of *C. matsuii* sp. nov.

EEO 9.4, NN 3.5, EE 8.2, FLL 37.0, HLL 52.5 and HT-IV 10.7.

*Ecological notes.*—This lizard was first found on a tree trunk 7–8 m in height, at night on 24 March 1979. The testes were well developed with  $10.0 \times 4.4$  mm in diameter in left and the epididymides also developed.

*Etymology.*—The name is dedicated to Dr. Masafumi Matsui, who continuously encouraged me in field work during the expeditions and always offered sound advice for my investigation.

*Cyrtodactylus pubisulcus* Inger, 1958  
(Figs. 13, 14)

*Cyrtodactylus pubisulcus.*—Inger, 1957 (1958), p. 261.

*Type specimens.*—A holotype FMNH 76251, a male collected by Robert F. Inger at Mt. Matang (=Mt. Serapi), Kuching District, Sarawak, on 26 July 1956. Two paratypes were also collected at the same locality on 28 July 1956 and are also in the collection of the Field Museum of Natural History.

*Diagnosis.*—A small-sized *Cyrtodactylus* with an adult body size of 59.3–74.2 mm in SVL; a preanal groove containing usually four pairs of pores, ranging between 3–5 pairs (7–9 pores in total); small granules of the posterior surface of thigh merging gradually into slightly larger ones on ventral surface; no femoral pores or enlarged femoral scales; 17–22 subdigital lamellae of fourth toe; largest lamellae under basal phalanges two or three times as wide as adjacent scales; 43–55 mid-ventral scale rows between lateral folds; dark crossbands, blotches or in rare cases longitudinal lines on dorsum.

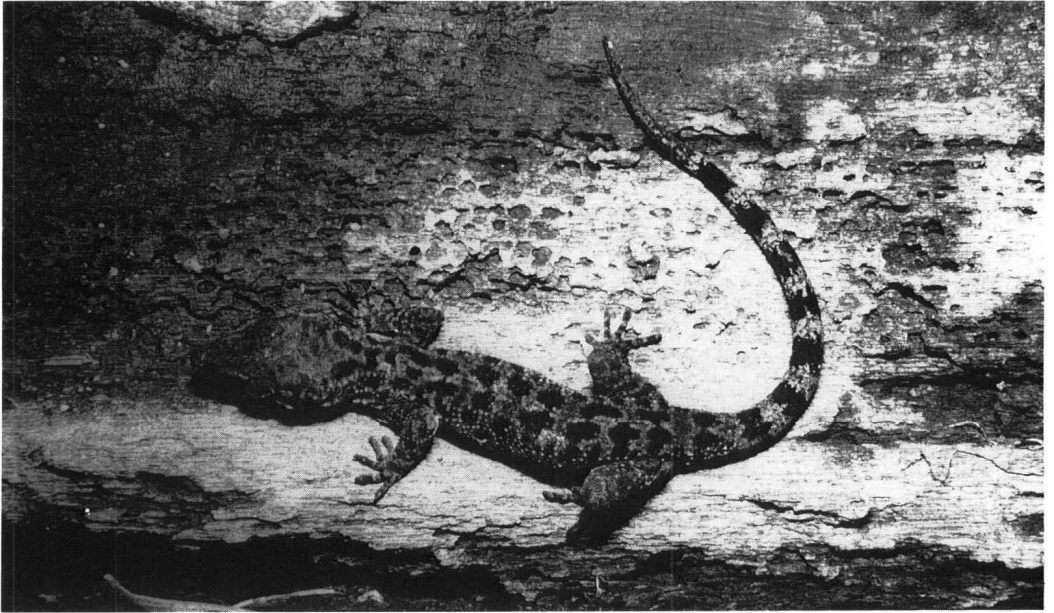


FIG. 13. *Cyrtodactylus pubisulcus* Inger, 1958. A male specimen (KUZ 12266) in life from Mulu National Park.

*Distribution.*—This species occurs in lowland forests of Sarawak. The highest site of collection was at 270 m in Mt. Serapi, Matang.

*Remarks.*—This species usually has a color pattern of dark crossbands and in rare cases longitudinal pattern (Inger and King, 1961). This color pattern variation most resembles that

of *C. baluensis*.

*Ecological notes.*—This species is an arboreal and nocturnal lizard and occurs syntopically with *C. consobrinus*. It was usually found at night on leaves, twigs, vines, small trees, logs and rocks, and less frequently on large tree trunks. On the other hand, *C. consobrinus* was usually observed on trunks of the large trees with crevices or holes. In the daytime the specimens were found in or under rotten fallen logs or in rotten bamboo.

This species breeds continuously throughout the year as shown by its reproductive pattern reported in Inger and Greenberg (1966).

*Specimens examined.*—Mulu, Miri Division, Sarawak: KUZ 12210, 12212–3, 12218–9, 12223, 12230, 12233, 12235–6, 12238–40, 12253, 12255–7, 12265–6, 12270–2, 12278, 12299, 12230; Seran River, Bintulu Division, Sarawak: FMNH 150480, 150485, 150501, 150509, 150511–2, 150539, 150543, 150565, 150590; Beloh River, Song, Kapit Division, Sarawak: KUZ 12375, 12391, 12393; Semangoh, Kuching Division, Sarawak: KUZ 12338; Mt. Serapi, Kuching Division, Sarawak: KUZ 12447.

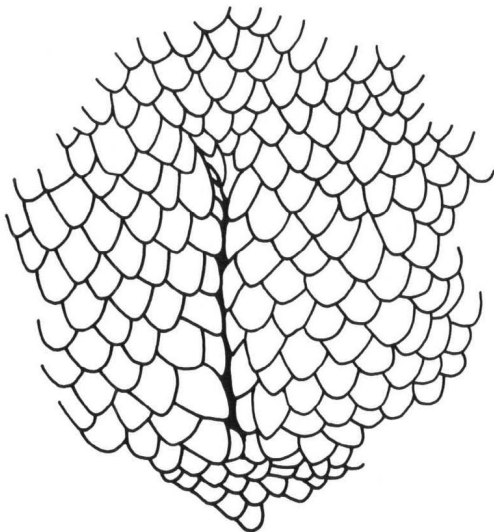


FIG. 14. A preanal groove in a male specimen (KUZ 12266) of *C. pubisulcus*.

*Cyrtodactylus yoshii* sp. nov.  
(Figs. 15, 16)

*Cyrtodactylus consobrinus* (part)—Inger, 1957 (1958), p. 264.

*Holotype*.—OMNH R 2995 an adult male collected at Sepilok Forest Reserve, Sandakan District, Sabah, Malaysia on 3 August 1987 by Hidetoshi Ota and Tsutomu Hikida.

*Paratypes*.—Sapagay Forest Reserve, Sandakan District, Sabah: FMNH 63625 adult female on 25 July 1950 by Robert F. Inger. Sepilok Forest Reserve, Sandakan District, Sabah: OMNH R 2996 adult male and OMNH R 2997 adult female on 21 July 1983 by M. Matsui; KUZ 8646 adult male on 23 July 1987 by H. Ota, KUZ 12564 adult male on 22 July 1983 by M. Matsui; KUZ 12565 adult female on 28 July 1983 by M. Matsui; KUZ 12566 adult male on 23 July 1983 by M. Matsui. Danum Valley, Lahad Datu District Sabah: FMNH 230097 and 230101 adult males, 230107 and 230111 adult females in 1986 by R. F. Inger, S. Emerson and H. K. Voris.

*Diagnosis*.—A medium-sized species of *Cyrtodactylus* with an adult body size of 75.2–96.2 mm in SVL; no preanal groove; 8–12 preanal pores forming a narrow angular series in a distinct hollow; small granules on posterior surface of thigh merging gradually in slightly larger ones on ventral surface; no femoral pores or enlarged femoral scales; 25–30 subdigital lamellae of fourth toe; subdigital lamellae of basal phalanges squarish, not widened, even the largest two times as wide as adjacent scales; 50–

58 mid-ventral scale rows between lateral folds, dark crossbands on dorsum.

*Description of holotype*.—Head oviform; forehead concave; snout obtusely pointed, 1.69 times the horizontal diameter of eye; ear-opening oval, distance from eye greater than eye diameter; eye with vertical *Gekko*-type pupil; rostral large, quadrangular, entering nostrils, partially split by a median vertical furrow; first upper labial entering nostril; upper labials, 10 on left and 12 on right; internasals small, five bordering rostral; superciliary scales forming a distinct “eye-brow”, slightly enlarged; remainder of upper head scales uniformly small; mental triangular, slightly narrower than bottom of rostral; lower labials 11; one large pair of postmentals forming a suture behind mental; second postmentals approximately one-third the size of the first, separated by first postmentals; two or three rows of slightly enlarged scales paralleling lower labials; remainder of gular scales very small; eight gular scales bordering first postmentals between second postmentals, larger than the remaining granular gular scales.

Body somewhat depressed, covered above with small granules interspersed with 17 irregular rows of subconical tubercles; ventrolateral fold indicated by tubercles; ventral scales small, cycloid, larger than dorsal tubercles, 48 scale rows between ventrolateral

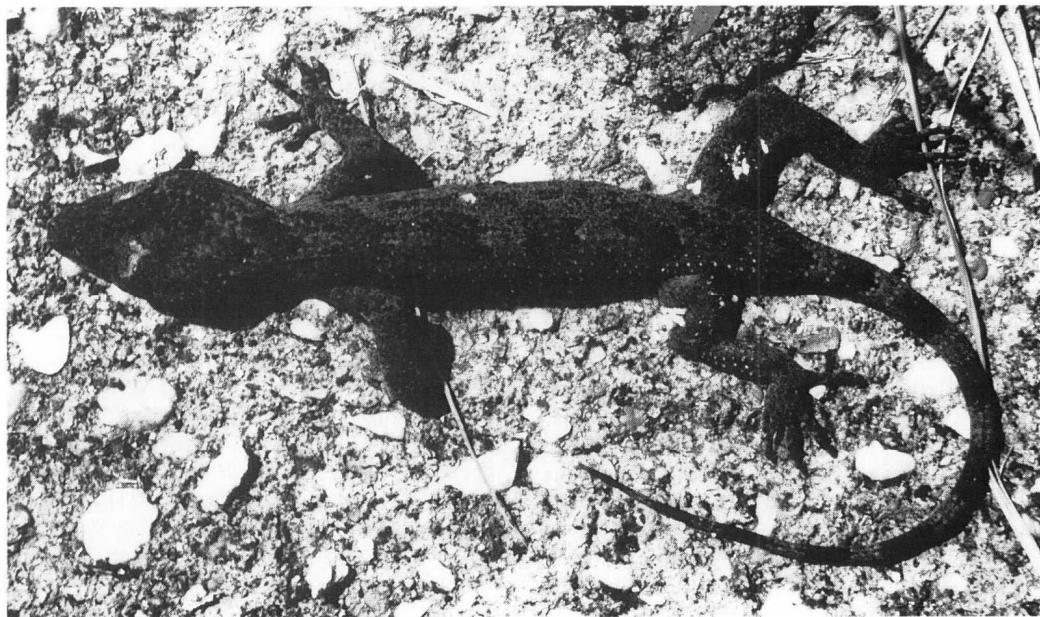


FIG. 15. *Cyrtodactylus yoshii* sp. nov. from Sepilok Forest Reserve, Sandakan District, Sabah. A male specimen (paratype, KUZ 8646).



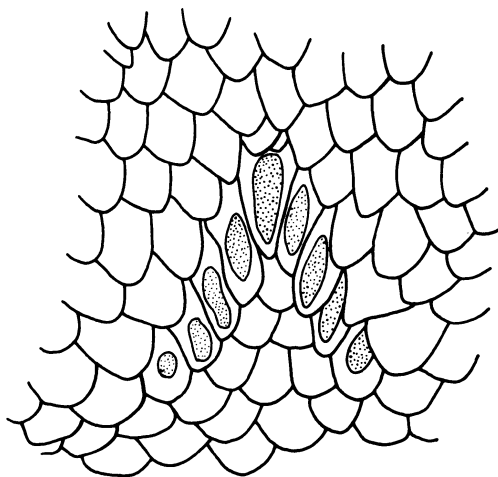


FIG. 16. Preanal pores in a male specimen (paratype, KUZ 2996) of *C. yoshii* sp. nov.

fold; no preanal groove; twelve large preanal pores in a narrow angular series in males.

Ventral surface of thigh covered with scales smaller than those of abdomen; and gradually becoming smaller posteriorly; no enlarged femoral scales or femoral pores; dorsal surface of limbs covered with small granules intermixed with tubercles.

Digits clawed slender, distal two or three phalanges make an angle with the proximal portion; mid-ventral row of scales on basal phalanges quadrangular, not enlarged, even the largest twice as wide as transverse diameter of adjacent scale row; subdigital scales of fourth toe from base to claw 27 on left and 26 on right.

Tail round, covered dorsally and laterally with small granules and rings of low tubercles; approximately ten rows of granules between successive rings of tubercles; subcaudals unpaired or paired, paired squarish, about twice the size of adjacent scales, unpaired twice as wide as paired; tip of tail regenerated.

Color (in life): body brown above, lighter below; a dark brown V-shaped stripe from lower posterior corner of eye passing just above ear opening and untied on nape and five V-shaped dark stripes from shoulder to waist; white dots on dorsal tubercles in lighter brown parts; head dark brown dorsally with small white dots on parietal; tail with dark rings, dorsally wider than interspaces; upper and lower lip with white spots; dorsal surfaces of limbs with obscure dark irregular bands.

Color (in alcohol): Color slightly faded but

same as in life.

Dorsal head and right shoulder were partly injured.

*Measurements of holotype (in mm).*—SVL 90.8, TL 75.6, RTL 8.7, AGL 38.8, SSL 32.5, SEO 23.0, HW 16.9, HD 10.3, EL 6.4, SE 10.8, EEO 7.7, NN 3.1, EE 6.3, FLL 31.0, HLL 42.0 and HT-IV 9.3.

*Variation.*—Females are slightly larger than males in SVL. Preanal pores are not developed in females, but larger adult females have an angular series of preanal scales and occasionally indistinct pores are recognizable. Males have 9–12 preanal pores forming a narrow angular series in a distinct hollow. These pores are partly covered by anteriorly surrounding scales. Numbers of upper and lower labials range 10–14 and 10–13, respectively.

*Distribution.*—Eastern part of Sabah, North Borneo, Malaysia.

*Ecological notes.*—This species occurs in lowland forests from near sea level (Sepilok Forest Reserve) to 500 m high (Danum Valley). During night surveys, the individuals were found on tree trunks or stumps, occasionally on the walls of huts in the jungle. They usually appeared near holes or crevices on trunks and frequently ran into these holes and crevices. These places were probably used for shelter in the daytime. This species occurs with *C. consobrinus* in Sepilok and also occurs with *C. baluensis* in Danum Valley. In these areas we also found *Gekko smithii* on tree trunks.

*Etymology.*—The name is dedicated to Dr. Ryozyo Yoshii. When he was a Chief of the Entomological Section of the Forest Research Centre of Sabah, he and his staff continuously helped our surveys in Sabah.

*Other specimens examined.*—Sepilok Forest Reserve, Sandakan District, Sabah: KUZ 8794, 8796, 8863; Danum Valley, Lahad Datu District, Sabah: FMNH 230087–9, 230091–6, 230098–100, 230102–10, 230112.

#### DISCUSSION

All eight species of the genus *Cyrtodactylus* now recognized from Borneo, except for *C. consobrinus*, are endemic to Borneo. Two other species of this genus have been reported from Borneo: *C. marmoratus* (Gray, 1831) originally described from Java (Günther, 1872; Van Lidth de Jeude, 1905; De Rooij, 1915) and *C. philippinicus* (Steindachner, 1869) described in the Philippines (Smith, 1925b). However, these two species were omitted from Bornean members by Inger (1957). These two species are



TABLE 1. Character distribution of Bornean *Cyrtodactylus*. Color pattern categorized as follows: A, light narrow network on head and narrow crossbands on dorsum; B, dark crossbands; C, dark blotched.

Species	Preanal groove	Preanal angular series	Preanal pores	Femoral pores	Enlarged femoral scales	Boundary of femoral scales	Mid-ventral scales between lateral folds	Adult body size (mm)	Subdigital lamellae	Color pattern
<i>C. baluensis</i>	absent	narrow	9–10	6–9	absent	present	40–45	71.7–85.5	21–23	B, C
<i>C. cavernicolus</i>	present	—	7–9	absent	absent	absent	51–58	63.5–80.8	22–26	B
<i>C. consobrinus</i>	absent	wide	9–10	0–6	present	absent	58–65	97.4–121.1	23–28	A
<i>C. ingeri</i> sp. nov.	absent	narrow	8	absent	absent	absent	40–43	63.5–75.8	23–27	C
<i>C. malayanus</i>	absent	wide	8–10	absent	absent	absent	58–62	70.4–80.3	21–23	A
<i>C. matsuii</i> sp. nov.	absent	wide	7	absent	absent	present	51	104.5	22	B
<i>C. pubisulcus</i>	present	—	4	absent	absent	absent	43–55	59.3–74.2	17–22	B, C
<i>C. yoshii</i> sp. nov.	absent	narrow	8–12	absent	absent	absent	50–58	75.2–96.2	25–30	B

easily distinguished from the Bornean species by a combination of several characters. *C. marmoratus* most resembles *C. baluensis*, but differs from the latter by having a continuous series of preanal-femoral pores. The lectotype, designated by Kluge (1985), is a male with 27 pores on left and 26 on right. On the other hand, *C. philippinicus* is most similar to *C. pubisulcus* but has a larger number of preanal pores (7–11) in a preanal groove (Brown and Alcala, 1978). I could not find any specimens of *C. marmoratus* and *C. philippinicus* in the Bornean samples. Probably, these two species are not members of the Bornean herpetofauna. The diagnostic characters of these two species are applied only to adult males. Therefore, females and juveniles are not identified correctly. Smith (1925b) reported a female and a juvenile of *C. philippinicus* from Tutu River of Kelabit Country and Mt. Poi, Sarawak. He compared these two specimens with that from Luzon Island and found that the former differs from the latter in having a larger number of belly scales. These two geckos identified as *C. philippinicus* probably belong to *C. pubisulcus*.

Comparative specimens examined.—*Cyrtodactylus philippinicus*—Negro Island, Philippine: FMNH 62911; *Cyrtodactylus marmoratus*—Wekmidar, Timor, Indonesia: FMNH 154845.

Key to the Species of *Cyrtodactylus* in Borneo

This key was constructed on the basis of male features. Thus, it is not easy to identify female or juvenile specimens in some case, since preanal pores and femoral pores are not developed or indistinct in females and juveniles. For detailed comparisons, character distribution of the Bornean species is provided in Table 1, which will be useful for identification.

1a Preanal groove present .....2

- 1b Preanal groove absent .....3
- 2a Preanal pores usually 4 pairs, ranging 3–5; fourth toe lamellae 17–22; largest lamellae of basal phalange less than 3 times as wide as adjacent scales .....*C. pubisulcus*
- 2b Preanal pores 2 pairs; fourth toe lammellae 22–26; largest lamellae of basal phalange more than 4 times as wide as adjacent scales .....*C. cavernicolus*
- 3a Subdigital lamellae not enlarged, even the largest of basal phalanges two times as wide as adjacent scales ...*C. yoshii* sp. nov.
- 3b Subdigital lamellae enlarged, the largest of basal phalange more than three times as wide as adjacent scales .....4
- 4a Small granules on posterior face of thigh merge gradually into slightly larger ones on ventral surface.....5
- 4b Small scales on posterior face of thigh meet larger scales on ventral surface at a sharp boundary.....7
- 5a Enlarged femoral scales on underside of thigh; males with or without femoral pores .....*C. consobrinus*
- 5b Males without enlarged femoral scales or femoral pores .....6
- 6a Mid-ventral scales between lateral folds less than 50, blotch pattern on dorsum ..... *C. ingeri* sp. nov.
- 6b Mid-ventral scales between lateral folds more than 50, white narrow network pattern on head and white narrow crossbands on dorsum .....*C. malayanus*
- 7a Medium-sized (SVL < 95 mm), males with femoral pores .....*C. baluensis*
- 7b Large-sized (SVL > 95 mm), males without femoral pores .....*C. matsuii* sp. nov.

Acknowledgments.—I wish to express my gratitude to R. F. Inger for giving me much useful suggestions and encouragement, and loaning valuable specimens. He also kindly provided data for the holotype of *C. con-*

*sobrinus*, which were examined by himself. I am grateful to M. Matsui, H. Ota and A. Mori for field assistance and collection of specimens in the surveys in Borneo. I also thank J. A. Wilkinson and M. Matsui for critically reading my manuscript. I am grateful to L. Capocaccia for giving me photographs of the holotype of *C. consobrinus*. Special thanks are due D. Hillenius and S.-I. Uéno for loaning materials, L. Chin and Yakup Nawi for allowing me to examine specimens, and Y. Shibata for providing valuable references. I am deeply grateful to R. Yoshii, L. Saikoh, A. Ajis and other staff of the Entomological Section of Forest Research Centre of Sabah, and R. Goh of Sabah Museum for continuous support during our expeditions to Sabah. I am also deeply grateful to David Labang, Abang Abdul Hamid and staff of the National Park & Wildlife Section and Forest Research Section, Forest Department of Sarawak for continuous support during our surveys in Sarawak. T. Hidaka, M. Matsui, M. Ishii, H. Ota, A. Mori and other members of the expeditions provided me valuable company during the surveys. The surveys conducted in Malaysia were supported by a Monbusho International Research Program (=a Grant-in-Aid for Scientific Research of Japan Ministry of Education, Science and Culture) in 1979, 1981, 1983, 1985, 1987 and 1989.

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# 要 旨 ボルネオ産ホソユビヤモリ属 (*Cyrtodactylus*)—3 新種の記載

足田 努

ボルネオ産ホソユビヤモリ属 (*Cyrtodactylus*) の分類について再整理を行ない、マレーシア・サバ州より、新たに 3 種, *C. ingeri* sp. nov., *C. matsuii* sp. nov., *C. yoshii* sp. nov. を記載

した。また, *C. consobrinus* と *C. malayanus* の再定義を行ない, ボルネオ産のこの属の検索表を作成した。

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